CLAIMS

What is claimed is:

1. A monolithic bubble-ink jet print head comprising:

a substrate having a plurality of resistance heat emitting bodies to heat ink and an ink supply opening to supply the ink from an ink cartridge;

a chamber plate formed on the substrate to form a flow channel structure including a plurality of restrictors connected with the ink supply opening and a plurality of ink chambers connected with the restrictors; and

a nozzle plate formed on the chamber plate to have a plurality of nozzles formed therethrough, wherein the nozzle plate has an anti-curing-deformation part formed at at least one of an inner surface thereof forming the ink chambers and an outer surface thereof forming a front or outer surface of the printer head to prevent an abnormal deformation from being generated therein during a curing process.

2. The monolithic bubble-ink jet print head of claim 1, wherein the nozzle plate is formed of a negative photo resist.

3. The monolithic bubble-ink jet print head of claim 2, wherein the negative photo resist comprises a photosensitive polymer selected from a group including a resin of an epoxy group, a resin of a polyimid group, and a resin of a polyacrylate group.

4. The monolithic bubble-ink jet print head of claim 1, wherein the nozzle plate is formed of a thermosetting polymer.

5. The monolithic bubble-ink jet print head of claim 4, wherein the thermosetting polymer comprises one of a polymer of an epoxy group, a polymer of a polyimid group, and a polymer of a polyacrylate group.

6. The monolithic bubble-ink jet print head of claim 1, wherein the chamber plate and the nozzle plate are formed in a body using a same material.

7. The monolithic bubble-ink jet print head of claim 1, wherein the anti-curing-deformation part comprises at least one groove disposed in a longitudinal direction between rows of the nozzles of the nozzle plate.

8. The monolithic bubble-ink jet print head of claim 7, wherein the at least one groove comprises a groove formed of one of:

a shape that has a wide width at a center part in the longitudinal direction of the nozzle plate and a narrow width at both edge parts in the longitudinal direction of the nozzle plate, and

a shape that has a same width at the center part and at the both edge parts.

9. The monolithic bubble-ink jet print head of claim 7, wherein the at least one groove comprises a plurality of grooves formed of one of:

a shape of which at least two grooves having a wide width at a center part in the longitudinal direction of the nozzle plate and a narrow width at both edge parts in the longitudinal direction of the nozzle plate are arranged in a row;

a shape of which at least two grooves having a same width at the center part and at both edge parts are arranged in a row;

a shape of which at least two grooves having a wide width at the center part and a narrow width at both edge parts are arranged parallel with each other in at least two rows;

a shape of which at least two grooves having a same width at the center part and at both edge parts are arranged parallel with each other in at least two rows;

a shape of which at least two grooves having a wide width at the center part and a narrow width at both edge parts are arranged to alternate with each other in at least two rows; and

a shape of which at least two grooves having a same width at the center part and at both edge parts plate are arranged to alternate with each other in at least two rows.

10. The monolithic bubble-ink jet print head of claim 7, wherein the at least one groove is formed by additionally coating a negative photo resist on the nozzle plate and then performing a light exposure and a developing with respect to the negative photo resist by using a photo mask having a pattern of the groove and the nozzles.

11. The monolithic bubble-ink jet print head of claim 10, wherein the negative photo resist comprises one of:

a liquid photosensitive-negative photo resist selected from a group including a resin of an epoxy group, a resin of a polyimid group, and a resin of a polyacrylate group; and

a solid photosensitive-negative photo resist.

12. The monolithic bubble-ink jet print head of claim 1, further comprising a contact pad to apply an electrical signal to the resistance heat emitting bodies from an outer circuit.

13. The monolithic bubble-ink jet print head of claim 12, further comprising a logic circuit having switching elements to increase a driving efficiency of the resistance heat emitting bodies.

14. A fabrication method of a monolithic bubble-ink jet print head comprising:

providing a substrate having resistance heat emitting bodies and a protective layer formed on one surface thereof;

forming a sacrificial photo resist mold having a flow channel structure including ink chambers and restrictors on the protective layer;

forming a chamber/nozzle plate having a nozzle on the sacrificial photo resist mold, the chamber/nozzle plate including an anti-curing-deformation part formed on an outer surface thereof;

removing the sacrificial photo resist mold from the substrate over which the chamber/nozzle plate is formed; and

curing the substrate from which the sacrificial photo resist mold is removed.

15. The method of claim 14, wherein the forming the sacrificial photo resist mold comprises:

forming a positive photo resist on the protective layer; and

performing a light exposure and a developing with respect to the positive photo resist by using a photo mask having a pattern of the flow channel structure.

16. The method of claim 15, wherein the positive photo resist comprises a photosensitive polymer comprising a resin of a novolac group.

17. The method of claim 16, wherein the positive photo resist is formed in a thickness ranging from approximately 5 μm to 50 μm.

18. The method of claim 15, wherein the process of performing the light exposure and the developing with respect to the positive photo resist is carried out by using an exposure of UV ranging from approximately 2 mJ/cm^2 to 4,000 mJ/cm^2.

19. The method of claim 14, wherein the forming the chamber/nozzle plate comprises:

coating a first negative photo resist on the substrate over which the sacrificial photo resist mold is formed;

exposing the first negative photo resist to light by using a photo mask having a pattern of nozzles;

coating a second negative photo resist on the exposed first negative photo resist;

exposing the second negative photo resist to light by using a photo mask having the pattern of the nozzles and the anti-curing-deformation part; and

developing the exposed second negative photo resist and the exposed second negative photo resist in turn.

20. The method of claim 19, wherein the coating the first negative photo resist is carried out by using a photosensitive polymer selected from a group including a resin of an epoxy group, a resin of a polyimid group, and a resin of a polyacrylate group.

21. The method of claim 19, wherein the exposing the first negative photo resist to light is carried out using an exposure of UV ranging from approximately 2 mJ/cm^2 to 2,000 mJ/cm^2.

22. The method of claim 19, wherein the coating the second negative photo resist is carried out using one of:

a liquid photosensitive-negative photo resist selected from a group including a resin of a epoxy group, a resin of an polyimid group, and a resin of a polyacrylate group; and

a solid photosensitive-negative photo resist.

23. The method of claim 19, wherein the exposing the second negative photo resist to light is carried out by using an exposure of UV ranging from approximately 2 mJ/cm^2 to 2,000 mJ/cm^2.

24. The method of claim 19, wherein the first and second negative photo resists are formed by a same material.

25. The method of claim 19, wherein the anti-curing-deformation part comprises at least one groove disposed in a longitudinal direction between rows of the nozzles of the chamber/nozzle plate at an outer surface of the chamber/nozzle plate, forming an outer or front surface of the print head.

26. The method of claim 14, wherein the removing the sacrificial photo resist mold comprises dissolving the sacrificial photo resist mold by using a solvent having an etch selectivity with respect to a positive photo resist.

27. The method of claim 14, wherein the curing the substrate comprises:

flood-exposing the substrate to light; and

hard-baking the substrate.

28. The method of claim 27, wherein the process of flood-exposing the substrate is carried out by using an exposure of UV ranging from 100 mJ/cm^2 to 5000 mJ/cm^2; and wherein the process of hard-baking the substrate is carried out for 5 minutes to 2880 minutes at a temperature ranging from 30 °C to 350 °C.

29. The method of claim 14, further comprising:

forming a preliminary ink supply opening in an opposing surface of the substrate after providing the substrate, the preliminary ink supply opening being formed not to completely penetrate the substrate;

forming an ink supply opening by etching the preliminary ink supply opening to completely penetrate the substrate after the forming the chamber/nozzle plate; and

cleaning an organic matter flowing into the surfaces of the substrate during the etching.

30. The method of claim 29, wherein the forming the preliminary ink supply opening comprises anisotropic dry etching until the substrate is about 20 μm in thickness.

31. A fabrication method of a monolithic bubble-ink jet print head comprising:

providing a substrate having resistance heat emitting bodies and a protective layer formed on one surface thereof;

forming a sacrificial photo resist mold having a flow channel structure including ink chambers and restrictors on the protective layer;

forming a chamber/nozzle plate having nozzles on the sacrificial photo resist mold, the chamber/nozzle plate including an anti-curing-deformation part formed on an inner surface thereof;

removing the sacrificial photo resist mold from the substrate over which chamber/nozzle plate is formed; and

curing the substrate from which the sacrificial photo resist mold is removed.

32. The method of claim 31, wherein the forming the sacrificial photo resist mold comprises:

forming a positive photo resist on the protective layer; and

performing a light exposure and a developing with respect to the positive photo resist by using a photo mask having a pattern of the flow channel structure.

33. The method of claim 32, wherein the positive photo resist comprises a photosensitive polymer comprising a resin of a novolac group.

34. The method of claim 33, wherein the positive photo resist is formed in a thickness ranging from approximately 5 μm to 50 μm.

35. The method of claim 32, wherein the performing the light exposure and the developing with respect to the positive photo resist is carried out by using an exposure of UV ranging from approximately 2 mJ/cm^2 to 4,000 mJ/cm^2.

36. The method of claim 31, wherein the forming the chamber/nozzle plate comprises:

forming a sacrificial anti-curing-deformation part pattern on the sacrificial photo resist mold by performing a light exposure and a developing with respect to the sacrificial photo resist mold by using a photo mask having a pattern of the anti-curing-deformation part;

coating a negative photo resist on the sacrificial anti-curing-deformation part pattern and the sacrificial photo resist mold;

exposing the negative photo resist to light by using a photo mask having a pattern of the nozzles; and

developing the exposed negative photo resist.

37. The method of claim 36, wherein the light exposure at the process of forming the sacrificial anti-curing-deformation part pattern is carried out by using an exposure of UV ranging from approximately 2 mJ/cm^2 to 2,000 mJ/cm^2.

38. The method of claim 36, wherein the coating the negative photo resist is carried out by using a photosensitive polymer selected from a group including a resin of an epoxy group, a resin of a polyimid group, and a resin of a polyacrylate group.

39. The method of claim 36, wherein the exposing the negative photo resist to light is carried out by using an exposure of UV ranging from approximately 2 mJ/cm^2 to 4,000 mJ/cm^2.

40. The method of claim 31, wherein the anti-curing-deformation part comprises at least one groove disposed in a longitudinal direction between rows of the nozzles of the chamber/nozzle plate at the inner surface of the chamber/nozzle plate, forming the ink chambers.

41. The method of claim 36, wherein the removing the sacrificial photo resist mold comprises dissolving the sacrificial photo resist mold and the sacrificial anti-curing-deformation part pattern by using a solvent having an etch selectivity with respect to a positive photo resist.

42. The method of claim 31, wherein the curing the substrate comprises: flood-exposing the substrate to light; and

hard-baking the substrate.

43. The method of claim 42, wherein the process of flood-exposing the substrate is carried out by using an exposure of UV ranging from 100 mJ/cm^2 to 5000 mJ/cm^2; and wherein the process of hard-baking the substrate is carried out for 5 minutes to 2880 minutes at a temperature ranging from 30 °C to 350 °C.

44. The method of claim 31, further comprising:

forming a preliminary ink supply opening in an opposing surface of the substrate after providing the substrate, the preliminary ink supply opening being formed not to completely penetrate the substrate;

forming an ink supply opening by etching the preliminary ink supply opening to completely penetrate the substrate after the forming the chamber/nozzle plate; and

cleaning an organic matter flowing into the surfaces of the substrate during the etching.

45. The method of claim 44, wherein the process of forming the preliminary ink supply opening is carried out by anisotropic dry etching until the substrate is about 20 μm in thickness.

46. The monolithic bubble-ink jet print head of claim 11, wherein the solid photosensitive-negative photo resist is a dry film resist.

47. The method of claim 22, wherein the solid photosensitive-negative photo resist is a dry film resist.

48. The method of claim 46, wherein the dry film resist is a derivative of acrylate compound.

49. The method of claim 47, wherein the dry film resist is a derivative of acrylate compound.

50. The method of claim 46, wherein the dry film resist is a derivative of epoxy compound.

51. The method of claim 47, wherein the dry film resist is a derivative of epoxy compound.